Math 13 Worksheet #15: Surface integrals of scalar functions

(1) True or false:
   (a) The result of integrating a function over a surface is a scalar.

   (b) For a region R in the $xy-$plane, $dS = dA$.

(2) Find the surface area of S, where S is the portion of the surface determined by $x = 9 - y^2 - z^2$ that lies on the positive side of the $yz-$plane (i.e., where $x \geq 0$).

(3) Evaluate $\iint_S f(x, y, z)dS$ where $f(x, y, z) = e^z$ and S is the portion of unit sphere in the first octant.

(4) Evaluate $\iint_S f(x, y, z)dS$ where $f(x, y, z) = x - z + y^2$ and S is given by $\boldsymbol{r}(u, v) =< u + v, 2\sqrt{u^2 + v^2}, u - v >$ on the region in the $uv-$plane bounded by the graphs of $v = u$ and $v = u^2$.